

REMARKS

Applicants initially note with appreciation the Examiner's indication of the allowance of claim 22. The foregoing amendments to claim 17 and addition of new claim 23 are respectfully submitted in response to the latest official action dated July 27, 2004. Applicants respectfully submit that in view of these amendments, not only claim 22, but all of the claims now set forth in this application are in condition for allowance, and such action is therefore respectfully solicited.

In the July 27, 2004, official action, the Examiner has rejected claims 17-21 as being unpatentable over the newly cited European patent (No. 492,040) in view of International Application No. WO 96/05365 ("the '365 reference") under 35 U.S.C. § 103(a). The Examiner contends that the European patent teaches a dewatering device 15 for dewatering the pulp to a consistency of 25% to 40%, a shredding device including a closed pulp shredding vessel 17, a transporting conduit and reaction vessel 23' for bleaching the shredded pulp with ozone 19, and furthermore that leakage of ozone into the atmosphere can cause a safety problem, thus teaching sealing the reactor from the atmosphere (citing col. 5, lns. 40-48), and regulating the pressure to prevent leakage.

The '365 reference is said to teach "gas-sealingly conveying" high consistency shredded pulp through a conveyor from a shredder having a pulp inlet and outlet to a reaction vessel. During operation the pulp is said to be conveyed through conveyor 16' carrying screw 24 and shaft 22' provided with breaker arms 40, which allegedly keep the pulp passing through the conduit non-compressed as they break up the pulp. This reference is said to further teach that in gas phase pulp bleaching downstream of the conveyor would be a vessel with a gaseous reagent which may be toxic, teaching the importance of the gas not leaking through the conveyor into the atmosphere.

The '365 reference is said to further teach gas sealing the conduit by using pressure sensor 36 and differential controller 38 to maintain an upstream pressure greater than the downstream pressure to prevent backwards leakage. The Examiner thus concludes that it would be obvious to prevent the ozone gas of the European patent from leaking backwards through the pulp in the conduit leading back to the shredder using the pressure sensor and pressure regulating device of the '365 reference, as both references are said to teach the dangers of leaking ozone into the atmosphere or the breaker arms of the European patent. This rejection is respectfully traversed in view of the above amendments and arguments and for the reasons set forth hereinafter.

In accordance with the present invention, as is specifically set forth in the specification, a new pulp treating method is set forth in which, by maintaining the outlet pipe from the pulp shredding vessel directly to the reaction vessel filled with shredded non-compressed pulp, and by maintaining the gas pressure in the pulp shredding vessel higher than that of the reactor vessel, ozone gas is prevented from leaking upstream out to the surroundings. At the same time, however, and particularly as compared to the prior art processes known in this field, neither a plug screw nor a fluffer is required, rendering the present method far superior and less costly than those in the prior art, including the references cited by the Examiner. In traditional pulp treatment systems, including the references cited by the Examiner, a fluffing step is required in order to fluff shredded pulp prior to bleaching, particularly when the shredded pulp is formed into a pulp plug in order to seal the shredding vessel from gas. Particularly in connection with shredded pulp having pulp concentrations of at least 20%, the pulp takes the form of flakes which form a coherent pulp body when compressed. Such a coherent pulp body or plug when

subjected to ozone gas must be initially fluffed or disintegrated into pulp with a high surface-to-volume ratio in order to facilitate reaction of the ozone gas with the pulp lignin.

Turning to the claims now set forth in this application, it is first noted that the claimed system requires that the gas sealed conduit connecting the pulp shredding vessel gas-tightly to the reaction vessel include an outlet pipe which "directly communicates" with the interior of the reaction vessel therethrough. This limitation thus distinguishes, for example, over the cited European patent, as well as the '365 reference, by excluding an intermediate fluffing step, as is required by these references, and particularly the European reference. At the same time, however, ozone gas is prevented from leaking from the reactor vessel out to the surroundings by the system hereof, even though it eliminates the very means for accomplishing this result in these references; namely, the creation of a gas sealing plug. Claim 17 thus requires transport means to continually transport shredded pulp without compressing the pulp from the shredding vessel through the outlet pipe in order to keep the outlet pipe filled with passing pulp without forming a gas sealing plug. This requirement clearly distinguishes over the cited art. Furthermore, claim 17 requires a pressure regulation device to regulate the gas pressure during operation in the pulp shredding vessel and in the reaction vessel to prevent ozone gas from leaking upstream into the shredding vessel. These limitations further distinguish over the art.

Turning to the European patent, the overall thrust of this patent is an ozone bleaching reaction in which the pulp is fluffed into as high a surface-area-to-volume ratio as possible, and is then treated in a specific manner in the reaction vessel itself. The background discussion of the European patent thus emphasizes the need for fluffing of such pulps in order to

prevent damage to the cellulosic material and to maintain contact with the ozone-containing gas.

Referring to FIG. 2 of the European patent, it is specifically stated that the pulp is fed to a conventional shredder 17 in which large chunks of pulp are broken up into smaller chunks and then to conventional fluffer 18, where the pulp is acted upon to become loose and homogeneous. Indeed, some ozone-containing gas is, in fact, added through line 20 to the fluffer 18 (see FIG. 1). On the other hand, it is noted that claim 17 specifically requires that the transport means continuously transport the shredded pulp from the pulp filling vessel without compressing the pulp out of the pulp filling vessel through the outlet pipe which is kept filled with passing pulp without forming a gas sealing plug, and furthermore that the conduit connecting the shredding vessel gas-tightly to the reaction vessel is gas sealed from the surroundings, such that the outlet pipe directly communicates with the interior of the reaction vessel through that conduit. Such direct communication is clearly not the case in the European patent, where indeed the fluffer 18 is a critical element of that system which must be maintained therein. On the other hand, in accordance with the present invention, use of a fluffer is unnecessary (and is, in fact, excluded by the present claims requiring direct communication between the outlet from the pulp shredding vessel to the reactor vessel) because of the elimination of any step in the shredding vessel in which a plug is necessary to be formed therein in order to prevent gas leakage. The latter is obtained in accordance with the present invention by the required pressure regulation device in which the gas pressure during operation in the pulp shredding vessel and the reaction vessel is prevented from leaking upstream into the pulp shredding vessel. None of this is in any way taught or suggested by the European patent.

Realizing the severe deficiencies of the prior art, the Examiner has attempted to combine the European patent with the '365 reference. In accordance with the '365 reference, however, conveyor 16 conveys the shredded pulp to outlet 18, and then to an ozone contactor, which can be in communication with a shredding or fluffing device 28 as shown in phantom in FIG. 1. The main thrust of the disclosure in the '365 reference is the critical significance of maintaining that the screw 24 and conveyor 16 formed porous plug serves as a sealing medium for preventing gaseous reagents which may be toxic from leaking or insinuating themselves through conveyor 16 for release into the atmosphere. As stated on page 4 of the '365 reference, the continuously forming and moving plug serves as the only required gas sealing means between the ends of the conveyor and the inlet 14 and outlet 18. While the reference states that during shutdown when the plug advance is halted and gas may possibly weep through the halted plug, a control means can be used in which oxygen or other inert gas is added in relatively small quantities to maintain a somewhat higher pressure in the feed to the sealing conveyor 16 as compared to the downstream pressure. Amended claim 17, however, specifically requires that the pressure regulation device regulate the gas pressure during operation in the pulp shredding vessel and the gas pressure in the reaction vessel to prevent leakage of ozone gas upstream through the outlet pipe into the pulp shredding vessel. Clearly, the disclosure in the '365 reference includes no system other than the plug during operation for sealing the pulp shredding vessel, and does not suggest that there would be any reason to employ even a small amount of inert gas during operation itself.

It is next noted that at page 6 of the '365 reference, reference is made to the fact that a gas source may provide a continuous, slightly elevated pressure at inlet 14 during system

operation in which a shorter length conveyor is utilized. It thus remains clear that this reference does not, and in fact cannot, suggest the use of a closed pulp shredding vessel and transfer means for continuously transporting the shredded pulp without compressing it out of the pulp shredding vessel through the outlet pipe in order to keep the outlet pipe filled with passing pulp that does not form a gas sealing plug.

The attempted combination of the '365 reference with the European patent is said to render the present invention obvious. The truth is, however, that there is no suggestion, when these references are fairly read in context, for ever making that combination, but beyond that there is no reason to suggest that, even if such a combination were made, the present invention would somehow result therefrom, at least not without extensive hindsight reconstruction. The combination, if made, would certainly include a shredder 17 of the European patent, as well as a conveyor for forming a gas sealing pulp plug from the shredded pulp, as taught by the '365 reference. The fluffer 18 would also be included, and in any event, it would be necessary to fluff the pulp plug leaving the conveyor prior to entry of the pulp into the reactor itself. Even if one were to utilize a slightly elevated pressure at the inlet during system operation in accordance with the disclosure at page 6 of the '365 reference, the system certainly would not include the required elements of claim 17, including a closed pulp shredding vessel with an outlet and transport means for continuously transporting the shredded pulp, without compressing the pulp, out of the pulp shredding vessel through the outlet so that the outlet is kept filled with passing pulp but does not form a gas sealing plug, nor a conduit gas sealed from the surroundings connecting the outlet of the pulp filling vessel gas-tightly to the reaction vessel so that the outlet pipe directly communicates with the reaction vessel through the conduit.

Finally, as for the Examiner's contention that the screw 24 and the breaker bars 40 shown in FIG. 2 of the '365 reference would keep the pulp passing through the conduit non-compressed as they break up the pulp, this is entirely incorrect, since initially the shredded pulp admitted into inlet 14 of conveyor 16 is clearly formed into a pulp plug which advances by screw 24 towards the breaker bars 40. Thus, formation of the pulp plug clearly requires some compression of the shredded pulp or pulp flakes, and furthermore, the breaker bars 40 cannot possibly fluff the pulp plug, but at best only break the pulp plug into smaller clumps.

It is therefore respectfully submitted that all of the claims now set forth in this application possess the requisite novelty, utility and unobviousness to warrant their immediate allowance, and such action is therefore respectfully solicited. If, however, for any reason the Examiner does not believe that such action can be taken at this time, it is respectfully requested that he telephone applicant's attorney at (908) 654-5000 in order to overcome any additional objections which he might have.

If there are any additional charges in connection with this requested amendment, the Examiner is authorized to charge Deposit Account No. 12-1095 therefor.

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Respectfully submitted,

By 

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